forward it must claim the part to which it is justly entitled. The steps which are necessary here for this work are as follows:—

1. *Preliminary.*—(*a*) A complete census of existing laboratories and workers; (*b*) a complete census of facilities for the education of scientific workers of all kinds and classes; (*c*) a complete census of all manufactures, their location, methods, raw materials, and output; (*d*) a complete census of all known existing raw materials of the country, which might be put to use for manufacturing or other purposes; (*e*) the collection of information from, and reciprocity with, organisations having similar objects throughout the Empire, and in Allied or friendly States.

2. *Standardisation.*—(*a*) Of scientific instruments of all kinds, whether used in laboratories or works; (*b*) and scientific control of apparatus and materials required in research.

3. *Initiation.*—The appointment of a central council which shall (*a*) receive and suggest problems for research; (*b*) by the organisation of manufactures of the same or similar products, ascertain what is necessary for their progress; (*c*) keep in close touch with all the universities and scientific societies in the country.

4. *Assistance.*—(*a*) By endowments to laboratories and workers; (*b*) by the collection, publication, and dissemination of information; (*c*) by the establishment and endowment of libraries; (*d*) by the advancement of scientific education in schools, colleges, and universities; (*e*) by increasing the equipment, etc., of existing laboratories, and the establishment of new ones; (*f*) by the provision of laboratories for carrying out suggested industrial processes on a small commercial scale with the sanction and approval of the central council.

5. *Co-ordination.*—(*a*) By annual reports from all laboratories; (*b*) by bringing all workers in the same branch together; (*c*) by the dissemination of information respecting similar work being done elsewhere; (*d*) by annual congresses of all scientific societies; (*e*) by annual congresses of manufacturers and trade interests.

If research should show that new industries can be established in this country with advantage, of which I cannot entertain the slightest doubt, it will be possible, by legislation if necessary, to assist their inception by the establishment of industrial banks which would advance funds for the purpose of financing them in their early stages, provided that the methods to be employed had been sanctioned by a competent authority as mentioned above. In addition to this, protection could be given, for a time at least, by patent laws, which, if unsuitable, could be amended, but this is a shield upon which too much reliance should not be placed.

History has shown that wars in the past have proved a stimulus to industry. There is no valid reason to believe that the present one will prove an exception to that rule, and hence the urgent necessity for the immediate organisation of all our resources, even were that not desirable on other more fundamental grounds. Co-operation is the key, and science, education, commerce, and manufacture must form one organic whole, each contributing its share to the common stock, their united effort for the common weal.

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## UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

Oxford.—The committee for geography has issued its third annual report, 1915–16. The school remains under the acting directorship of Mr. H. O. Beckit pending the appointment of a successor to the late Dr. A. J. Herbertson. The number of students devoting the whole or a great part of their time to geography during the year was twenty-three, and there was also a number of part-time students. Despite depletion of the staff, the whole work of the school was successfully carried out, thanks to the assistance of past students. Dr. R. N. Rudmose Brown was appointed an examiner in succession to Mr. A. R. Hinks, whose term of office had expired. The eighth biennial vacation course, held last August, was attended by 125 students.

At a conference of directors of public instruction held at Delhi on January 22 Lord Chelmsford, Viceroy of India, in an address of welcome referred to the paramount importance of education in India. From the *Pioneer Mail* we learn that, speaking of technical training, he said at the present moment, when the Government of India is hoping for a lead from the Industrial Commission in the direction of industrial development, technical training looms large in the educational sphere. The term "technical" should, he urged, be used in its widest and not its narrowest sense—that is to say, the claims of agricultural and commercial education should not be overlooked. "There are," he continued, "some who say we have nothing to teach the men on the land in this country. I cannot claim to talk with authority on such a question, but having seen something of the work of scientific agriculture in other parts of the world, I take leave to doubt such a statement. The great advance made by scientific agriculture during the last half-century justifies us in pressing forward with a policy of agricultural education, and though you would not claim to speak as experts on the agricultural side, your educational experience qualifies you to give us useful hints with regard to an advance along this road." Referring to the commercial side of education, the Viceroy expressed surprise to find how little has been done, in spite of India's large and growing commerce, to develop commercial education. Compared with a technical institution, a commercial school is, he said, a relatively cheap institution, and one would think that there was a great opening in big towns for good commercial schools. The second point on which Lord Chelmsford laid emphasis is that in technical training in its narrower sense we must not lose sight of workshop practice in outside works. Laboratory training, however good, is no real substitute for the discipline of the workshop. Technical training divorced from workshop experience is likely to prove a snare and a delusion.

## SOCIETIES AND ACADEMIES.

### London.

**Royal Society**, February 22.—Sir J. J. Thomson, president, in the chair.—S. A. **Smith**: The fossil human skull found at Talgai, Queensland. This is a description of the fossil human skull that was shown by Profs. Edgeworth David and J. T. Wilson at the meeting in Sydney of the British Association. Before the specimen could be studied it was necessary to clear away a hard mineral incrustation of carbonate of lime which was coloured with iron salts. It was then found to be the highly fossilised and much fractured skull of a male youth not more—probably some years less—than sixteen years of age. The brain-case, the capacity of which was at least 1300 c.c., is well within the range of variation of modern aboriginal Australian skulls, to which it presents a very striking similarity in general conformation, as well as in respect of the distinctively Australian characteristics. But the facial skeleton reveals an important contrast. The exceptionally large teeth—the canines especially—have been responsible for a great development of that portion of the alveolar process which lodges the incisor, canine, and premolar teeth. In respect of this feature the Talgai skull is probably more primitive and ape-like than that of any other known specimen belonging to the human family, excepting only the Piltdown skull, the dental arcade of which that of the Talgai skull, in spite of its immaturity, nearly approaches, not only in actual size, but also in its relative proportions. The fact that the brain-case had already reached the stage represented in the modern Australian aboriginal, while the face still retained much of the grossness and uncouthness of the ape's, is a further confirmation of the view that, in the evolution of man, the brain first acquired the human status and the refinement of the features came afterwards.—Dr. C. **Chree**: The magnetic storm of August 22, 1916. The paper gives an account of a magnetic storm, accompanied by aurora in Scotland, which occurred on August 22–23, 1916. A comparison is made of the results derived from the magnetic curves at Kew and Eskdalemuir Observatories. The disturbance was much larger at the latter station than at the former. During, however, the most disturbed period, both places afforded a conspicuous example of the type of storm in which the direction of the disturbance vector shows a rapid rotation. During this period the disturbance vector diagram in the horizontal plane was described continuously in a counter-clockwise direction, nearly a complete revolution being effected in the course of one hour.—Prof. W. H. **Young**: The ordinary convergence of restricted Fourier series.

**Optical Society**, February 8.—J. W. **French**: More notes on glass grinding and polishing. Glass is abraded by splintering, and the efficiency of an abrasive is determined by the form of the grains, their hardness, and their cleavage. A grain that cleaves and presents flat surfaces loses its cut, whereas one that retains its original form when broken suffers only a temporary loss of cut during the grinding process. When precautions are taken to prevent clogging of the abrasive, the amount of glass removed is directly proportional to the relative speed of the grinding tool and the glass. In lubrication too much water has the same bad effect as too little water. A new method was described of comparing the qualities of ground glass surfaces. Polishing was divided into wet polishing, in which material is principally removed, and dry polishing, in which the surface sleeks are filled or closed. A mechanical theory of polishing was elaborated. Rouge consists of grains of ultra-microscopic size. These grains appear to gather, snowball fashion, into lumps of about two wave-lengths diameter, and in this condition they plough grooves in the surface layer. During the second stage these grooves are closed up, thus improving the brilliancy of the surface. When a rounded point is drawn heavily over the surface, a series of semicircular cracks is produced. The cracking takes place on the tension side, and not on the pressure side; the cohesion of the surface layer is less than that of the underlying material. The diameters of the cracks produced have a definite relationship to the pressure. With the semicircular cracks there are associated two series of tangential cracks. Fire-glazed surfaces and fracture-glazed surfaces give similar results; also polished quartz; but the natural polished surfaces of crystals resulting from crystal growth do not exhibit sleeks or surface cracks, thus suggesting the non-existence of a surface layer.

**Linnean Society**, February 15.—Sir David Prain, president, in the chair.—J. H. **Owen**: The home-life of the sparrow-hawk (*Accipiter nisus*, Linn., Pall.). After a brief description of the life of the birds from autumn to spring, an account was given of the nesting habits, from the selection of the nesting site in March to the scattering of the young at the end of July or in the early part of August. A series of lantern-slides was exhibited to illustrate various features of the nesting habits and growth of the young. Of these, particular interest attached to a series showing the various methods of brooding in wet weather and the care taken over the welfare of the youngest nestling. Another series showed the young able to feed themselves, while the hen keeps watch above the nest during the course of the meal until the young are all asleep after the food is finished. Slides were shown of the visits of young and the old birds to the nest after the young had left.

**Royal Microscopical Society**, February 21.—Mr. E. Heron-Allen, president, in the chair.—Drs. A. H. **Drew** and Una **Griffin**: The parasitology of *Pyorrhoea alveolaris*. The authors stated that careful microscopic examination of material from cases of pyorrhœa showed that, in the great majority of cases, at least two species of Amœbæ were present. One of these Amœbæ appeared to be a semi-parasite partially modified by anaerobic life in the pockets around the teeth. When stained by the iron-hæmatoxylin method, this form showed a valkamfia type of nucleus; it also possessed a flagellate phase in its life-cycle. The name *Amoeba buccalis* was proposed for this type, which had been successfully cultivated, after concentration of the cysts by Dr. Cropper's method. The other species was a true Entamœba, and corresponded to *Entamoeba gingivalis*. Two new flagellates had been found in the pockets, together with at least six species of spirochætes.

**Mathematical Society**, March 1.—Mr. G. H. Hardy, vice-president, in the chair.—A. E. **Jolliffe**: Some properties of a quadrangle formed by the points of contact of the tangents drawn to a nodal cubic from any point.—E. H. **Neville**: Indicatrices of curvature.

### PARIS.

**Academy of Sciences**, January 15.—M. d'Arsonval in the chair.—G. **Bigourdan**: The first scientific societies of Paris in the seventeenth century.—E. **Ariès**: The law of molecular entropy of fluids taken at corresponding states. The application of the equation of state deduced in an earlier paper.—W. **Kilian** and J. **Révil**: The history of the Arc valley at the Pleistocene period.—A. **Khintchine**: Asymptotic differentiation.—H. **Arctowski**: The heliographic positions of the sun-spots and magnetic storms. After a historical summary of the previous work on this subject the author especially examines the hypotheses of Veeder, Ricco, and Terby. Using data for magnetic storms from observations made at Porto Rico and Greenwich, and Greenwich figures for sun-spot areas, the conclusion is drawn that Veeder's hypothesis is completely out of accord with the observed facts. Terby's hypothesis is equally faulty, but the views of Ricco are partially verified.—J. **Deprat**: The Ordovician and Gothlandian in the north of Tonkin and the basin of the upper Iou-Kiang.—M. **Raclot**: The origin of terrestrial magnetism. Assuming that the internal mass of the earth consists of an alloy in which iron predominates, then, on account of the high temperature, the iron under the continents would be above the critical point at which magnetic properties disappear (750° C. to 900° C.). Under the oceans, on the contrary, by reason of the more rapid cooling assumed by Faye, the superficial layer could have arrived at a temperature below 750° C., and, in consequence, a certain thickness of this could be magnetic. Wulde has shown that if a globe is covered with thin sheets of iron covering the ocean areas, then the distribution of magnetism on this globe reproduces terrestrial magnetism.—L. **Bordas**: Biological and anatomical observations on some Cetononæ.—H. **Vincent**: The prophylaxy of the infection of wounds received at the front. Comparative study of some antiseptic agents. Trials have been made of sodium fluoride, sodium formate, zinc chloride, calcium hypochlorite, boric acid, borax, copper sulphate, ferrous sulphate, potassium permanganate, and, as an accessory, iodoform. The iodoform, borax, and boric acid were applied in powder; the remainder also in powdered form, but diluted with 90 per cent. of inert powder. Iodoform, ferrous sulphate, boric acid, borax, potassium permanganate, formate of soda, and zinc chloride proved to have insufficient bactericidal power. Sulphate of copper and sodium fluoride have strong antiseptic properties, but are too toxic. A mixture of calcium hypochlorite (10 parts) and dry powdered boric acid (90 parts) is finally recommended for first-aid treatment. It possesses the necessary bactericidal power, gives no pain, and is hæmostatic on account of the calcium chloride it contains. Details of the results obtained by the use of this powder will be given later.—L. **Rompant**: The preservation of eggs.

## BOOKS RECEIVED.

Year-Book of the Scientific and Learned Societies of Great Britain and Ireland. Thirty-third annual issue. Pp. vi+336. (London: C. Griffin and Co., Ltd.) 7*s*. 6*d*. net.

Minor Surgery and Bandaging (Heath-Pollard) for the Use of House Surgeons, Dressers, and Junior Practitioners. By Dr. H. M. Davies. Sixteenth edition. Pp. x+476. (London: J. and A. Churchill.) 8*s*. 6*d*. net.

Community: A Sociological Study. By Dr. A. M. Maciver. Pp. xv+437. (London: Macmillan and Co., Ltd.) 12*s*. net.

Fundamental Conceptions of Modern Mathematics. Variables and Quantities, with a Discussion of the General Conception of Functional Relation. By R. P. Richardson and E. H. Landis. Pp. xv+216. (Chicago and London: The Open Court Publishing Co.) 1.25 dollars net.

## DIARY OF SOCIETIES.

*THURSDAY*, MARCH 8.

ROYAL SOCIETY, at 4.30.—Some Effects of Growth-promoting Substances (Auximones) on the Growth of *Lemna minor* in Culture Solutions: W. B. Bottomley.—Some Effects of Growth-promoting Substances Auximones) on the Soil Organisms concerned in the Nitrogen Cycle: Florence A. Mockeridge.

ROYAL INSTITUTION, at 3.—Sponges; a Study in Evolutionary Biology: Prof. A. Dendy.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—Voltage Regulation of Rotary Converters: G. A. Juhlin.

*FRIDAY*, MARCH 9.

ROYAL INSTITUTION, at 5.30.—The Treatment of Wounds in War: Sir Almroth Wright.

MALACOLOGICAL SOCIETY, at 7.—The Genitalia of *Neanthinula aculeata*: Dr. A. E. Boycott.—(1) The Radula of the Genus Cominella; (2) A Colony of *Purpura lapillus*, with Operculum Malformed or Absent; (3) Note on the Adventures of the Genus named Lucena; (4) Note on the Da Costa Plates adapted for Rackett's Edition of Pulteney's Catalogues: B. B. Woodward

ROYAL ASTRONOMICAL SOCIETY, at 5.—Occultations Observed at Eltham, 1915: M. E. J. Gheury.—Sun-spot Observations made at Rostow-on-Don: G. D. Tscherny.—(1) The Viscosity of the Earth. III.; (2) Two Applications of Jacobi's Integral: The Moulton-Gylden Theory of the Gegenschein, and Orbital Motion in a Resisting Medium: H. Jeffreys.—The Number of Stars of Different Magnitudes in the Hyderabad Astrographic Catalogue, Zone—17°: R. J. Pocock.—The Surface Currents of Jupiter during the Apparition of 1916–17: G. Bolton.—Preliminary Values of the Variations of Latitude at Greenwich for 1916 Royal Observatory, Greenwich.—(1) Differential Star Corrections; (2) Wireless Time Signals; Some Suggested Improvements: W. E. Cooke.—Frederick de Houtman's Catalogue of Southern Stars, and the Origin of the Southern Constellations: E. B. Knobel.—*Probable Paper*: The Opportunities Afforded by the Eclipse of 1919, May 28, for Verifying Einstein's Theory of Gravitation: Sir F. W. Dyson.

PHYSICAL SOCIETY, at 5.—To Measure the Pressure in a High Vacuum by Means of Logarithmic Decrement: Dr. P. E. Shaw.—(1) A Diffraction Colour Box; (2) Demonstration of Interference Effects with a Thorpe Grating: A. W. Clayden.

*SATURDAY*, MARCH 10.

ROYAL INSTITUTION, at 3.—Imperial Eugenics; Saving the Soldier: Dr. C. W. Saleeby.

*MONDAY*, MARCH 12.

ROYAL SOCIETY OF ARTS, at 4.30.—Memorials and Monuments: L. Weaver.

*TUESDAY*, MARCH 13.

ROYAL INSTITUTION, at 3.—Geological War Problems: Prof. J. W Gregory.

ROYAL ANTHROPOLOGICAL INSTITUTE, at 2 (Joint Meeting with the Prehistoric Society of East Anglia).—Presidential Address: Dr. A. E. Peake.—Plateau Deposits and Implements: R. A. Smith.—The Position of Prehistoric Research in England: J. Reid Moir. At 5.30.—Some Prehistoric Questions: The President.—The Menhirs of Madagascar: A. L. Lewis.

*WEDNESDAY*, MARCH 14.

ROYAL SOCIETY OF ARTS, at 4.30.—The Supply of Fertilisers during the War: Dr. J. A. Voelcker.

GEOLOGICAL SOCIETY, at 5.30.

*THURSDAY*, MARCH 15.

ROYAL SOCIETY, at 4.30.—*Probable Papers*: The Initial Wave Resistance of a Moving Surface Pressure: Prof. T. H. Havelock.—Experiments with Mercury Jets. (1) The Relation between the Jet-length and the Velocity of efflux; (2) A Comparison with Jets of Other Liquids: Prof. S. W. J. Smith and H. Moss.—The Mode of Approach to Zero of the Coefficients of a Fourier Series: Prof. W. H. Young.—The Dissipation of Energy in the Tides in Connection with the Acceleration of the Moon's Mean Motion: R. O. Street.

ROYAL INSTITUTION, at 3.—Sponges: a Study in Evolutionary Biology: Prof. A. Dendy.

ROYAL SOCIETY OF ARTS, at 4.30.—The Industrial and Economic Development of Indian Forest Products: R. S. Pearson.

*FRIDAY*, MARCH 16.

ROYAL INSTITUTION, at 5.30.—Scientific Forestry for the United Kingdom: Sir J. Stirling Maxwell.

INSTITUTION OF MECHANICAL ENGINEERS, at 6.—Heat Treatment of Large Forgings: Sir W. Beardmore, Bart.—Heat Treatment of Steel Forgings: H. H. Ashdown.

*SATURDAY*, MARCH 17.

ROYAL INSTITUTION, at 3.—Imperial Eugenics: Saving the Future: Dr. C. W. Saleeby.

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